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ABSTRACT

The NCTM Standards have multiple origins. In part they developed out of concerns from NCTM committee members about textbook adoption policies that favored traditional texts. They also constituted a response to the public furor caused by "A Nation at Risk" and instantiated the 1980 recommendations on curriculum in "An Agenda for Action." International curriculum and research projects also influenced the NCTM Standards. The initial NCTM emphasis on standards as accountability criteria shared certain similarities with the National Curriculum effort in England and Australia, where reform is reportedly stalled. The more recent view of the "Standards" as aspiration may help extend the duration of their influence. (Author)

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INTERNATIONAL INFLUENCES ON THE NCTM STANDARDS: A CASE STUDY OF EDUCATIONAL CHANGE

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The NCTM *Standards* have multiple origins. In part they developed out of concerns from NCTM committee members about textbook adoption policies that favored traditional texts. They also constituted a response to the public furor caused by *A Nation at Risk*, and instantiated *An Agenda for Action's* 1980 recommendations on curriculum. International curriculum and research projects also influenced the NCTM *Standards*. The initial NCTM emphasis on standards as accountability criteria shared certain similarities with the National Curriculum effort in England and Australia, where reform is reportedly stalled. The more recent view of the *Standards* as aspiration may help extend the duration of their influence.

The publication of the *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989) was the culmination of a series of important events in mathematics education in North America. The development of these *Standards* is usually described in the context of conference recommendations from the US (Crosswhite, Dossey, & Frye, 1989; Romberg & Webb, 1993), but international forces were also at work. The purpose of this paper is to describe the origins of the NCTM *Standards* and to analyze how international forces helped shape the *Standards* and the reform movement in mathematics.

This case study has focused on understanding the origins of the NCTM *Standards*, as well as their development, dissemination, and impact in K-12 classrooms. Our methods followed the recommendations of Stake (1994). Main sources of data included interviews with NCTM leaders and state mathematics supervisors in the US. One of eight studies of educational change in the US (see Romberg & Webb, 1993), our project is part of an international effort coordinated by the Organisation for Economic Cooperation and Development in Paris. One goal of our project is to explain to policy makers from abroad how a professional organization like NCTM could provide direction for educational change, a task that is usually left to government officials.

Origins of the NCTM *Standards*

The decline of test scores was one of several issues that were influential in the push for educational reform. For example, *A Nation at Risk* (NCEE, 1983) noted the decline in SAT scores from 1963 to 1980. NCTM leaders, however, put more emphasis on the results from the Second International Mathematics Study (SIMS). Although the NCTM *Standards* were being planned before the SIMS data were reported, the preliminary results were known to NCTM leaders. These leaders did not see their task as organizing mathematics education for an international compe-

SE 057 203

tition; they were concerned about the weakness in the US curriculum that was reflected in the data. As one NCTM leader put it:

> We weren't being motivated by "world class standards" at that point. [But] we did have comparative data, especially in terms of the Japanese curriculum, which showed so much more intensity than ours did.

Although the SIMS data were important in the thinking of NCTM leaders, reports of the Second International Study (e.g., McKnight et al., 1987) were not cited in the list of references in the NCTM *Standards* (1989). That omission caused some concern, but an NCTM leader described their reasoning this way:

> I think that if you base your argument for [reform] on a temporal research result, you're being reactionary rather than proactive. . . . The focus was to take the negative, the competitive statements out of the document, and make the document a proactive, positive statement. Let's say what we believe and then act on it.

The Instructional Issues Advisory Committee (IIAC)

The quality of the US curriculum was related to IIAC's concerns about accountability. The earliest talk of professional standards in NCTM circles probably occurred in IIAC, after that committee and the Research Advisory Committee (RAC) received a request to help one of NCTM's affiliated groups with criteria for evaluating textbooks. "There was some concern [from] several places that textbooks, and therefore curricula, were being driven by non-professional considerations, political log rolling, and so on." An RAC member recalled:

> RAC had a request for information about research on the efficacy of John Saxon's algebra. Our discussion quickly broadened to the general question of evaluating curriculum materials in the absence of standards by which to measure "success" or desirability...I recall that we were acutely aware that...we were asking NCTM to abandon its long-standing and explicit policy not to pass judgment on various curriculum efforts.

IIAC had also considered the issue and took on the task of developing standards for textbook selection in early 1983, before the appearance of *A Nation at Risk* (NCEE, 1983). A committee member recalled how the notion of standards got extended:

> Somehow we got onto the idea that maybe what IIAC ought to be about was defining professional standards in general—not just for selection of textbook material but for content of the curriculum, for teaching, and so on.

The recommendations from IIAC had a strong accountability emphasis:

> There was talk about something comparable to the Good Housekeeping Seal of Approval. We would have standards that could be applied to textbooks [and] tests. The ones that were judged to meet the standards then would be given the Seal of Approval and the ones that weren't would not.

The recommendations of RAC and IIAC began to coalesce in the spring of 1983 at a meeting of the NCTM Board of Directors:

> It was interesting that not only RAC was asking the Council to take a proactive stand, but [also IIAC. We] had already seen the raw data from SIMS, which weren't known yet by the other board members . . . and [data from] the National Assessment of Educational Progress, too. So issues were coming together. IIAC said that we needed to look at setting some goals to stop . . . this fad and that fad from affecting our curriculum.

Meetings of Leaders

Shortly after the publication of the *Agenda,* the Reagan Administration eliminated all funding for K-12 mathematics and science education from the budget of the National Science Foundation (NSF). To the dismay of those who worked in the Education Directorate at NSF, some NSF leaders capitulated easily to the Reagan Administration and made the preservation of research programs in science and engineering their main priority. Meanwhile, *A Nation at Risk* (NCEE, 1983) received "unprecedented" media attention. All America heard that "Our Nation is at risk. . . . the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people" (NCEE, 1983, p. 5). Many leaders give credit to *A Nation at Risk* for helping establish a climate that would support change:

> I think *A Nation At Risk* (NCEE, 1983) served primarily as a spark plug, a starting point for people...States were requiring a third year of mathematics and some other things and making political decisions without ever talking to the math ed community. So that...started a lot people talking about the need for reform.

In the wake of *A Nation at Risk,* two meetings were particularly central to the development of the NCTM *Standards.* In the words of one participant:

> After *A Nation at Risk* came out, the Conference Board of the Mathematical Sciences organized a retreat at Airlie House in Virginia [funded by NSF]. It was at that meeting that Joe [Crosswhite] introduced a motion...that there should be a set of standards for school mathematics at NCTM.

In December, 1983, a month after the meeting in Virginia, the Department of Education sponsored a meeting at Wisconsin: "School Mathematics: Options for the 1990s." The report of that meeting (Romberg, 1984), with its recommendations for new K-8 and 7-14 curriculum guidelines, also shows a direct link to the *Standards*.

Development of the NCTM *Standards*

When the writers of the NCTM *Standards* gathered in Utah in 1987, they were provided with a rich set of resources to help stimulate their thinking. These materials were mainly written in English, so the number of foreign countries that were represented was small. But the materials did include the Cockcroft report and "a library of SMP [School Mathematics Project] materials" from England. As one leader put it:

> We tried to organize materials from other countries—England, the Netherlands, Australia. Some of us spent a fair amount of time down at Chicago looking at some of the [Wirszup] materials...The Math Curriculum Teaching Project [from Australia] had a lot of interesting examples.

Other work from England was a significant influence at the 9-12 level:

> At the time that we were beginning to start on the *Standards*, there was some interesting work being done over at the Shell Centre in England in terms of more qualitative applications of mathematical thinking, for example, the work on the language of functions and graphs.

As the staff member who was responsible for materials noted, "We just flooded them with stuff." There were materials by D'Ambrosio (of Brazil) dealing with ethnomathematics, and the writings of Freudenthal (of The Netherlands), whose work on "didactical phenomenology" was thought to be "a little hard for most people" to get through. Writers rarely mentioned these works, but the leadership was clearly influenced by them, and saw them as compatible and supportive:

> There was a sense that kids ought to experience mathematics—that they're reinventing some of the important ideas. And then teachers negotiate with them the language in terms of signs and symbols that we commonly use.

Other international researchers who had the eye of the leadership included G. Vergnaud of France, especially his work on multiplicative conceptual fields, and J. de Lange of The Netherlands, with his "realistic mathematics education." The work of these researchers demonstrates some of the international influences on the *Standards*, especially in terms of changes in theories of learning. Steffe and Kieren (1994) have noted the influence of constructivism on the NCTM *Standards*. A leader comments:

> The term that we did not use in the write up of the *Standards,* but we certainly talked about, is...the social constructivist notion of learning.... One of the arguments that people have made is, "Why didn't you call yourselves social constructivists?" But that would have put off people who didn't understand that set of notions.

Another leader reported: "I don't remember a constructivist approach being that hot at the time that the *Standards* were being developed." But some writers were definitely being encouraged to think along constructivist lines:

> I remember coming back and talking with some of my [constructivist] colleagues [in 1987], and they thought the idea of standards was very authoritarian—they were pretty negative toward it. When we met again [later in 1987], even then we were drifting toward the *Standards* as more of a vision—a less authoritarian perspective.

The debates over the substance and the wording of the standards was often intense. As an example, consider the case of a "standard" that was suggested by one group but did not garner enough support to survive until the final draft. That proposed standard was concerned with the way that history and culture influence mathematics and its teaching. An early version of the standard, entitled "Historical and Cultural Significance," follows:

> In Grades 5-8 the mathematics curriculum should foster an historical and cultural awareness of mathematics so that students are able to:
>
> - Explore mathematics in relation to the arts, humanities, and sciences.
> - Appreciate that mathematics is an invention of the human mind.
> - Appreciate the potential of mathematics as an enjoyable activity.
> - Appreciate mathematics as a powerful, creative human activity.

The elaboration that was outlined for this proposed standard included mathematics and music, history of mathematics, recreational mathematics, and numeration systems. As some writers look back on it now, the standard would have fit very nicely with the current interest in ethnomathematics, a topic of increasing importance in research (D'Ambrosio & D'Ambrosio, 1994). At that time, however, the topic was seen as difficult to communicate and not central to the content emphasis of the *Standards.* In the words of one source:

> The middle school group came up with the standard on culture [but] the *Standards* were conceived as focusing entirely on con-

> tent, and culture was not perceived to be content. The reaction was, "Well, this is too touchy-feely." . . . The frustration that I had, and still have with that rejection, is that in fact there is a whole philosophy of mathematics that was developing at that time that looks at mathematics as a cultural creation. [But] the members of the working groups really hadn't had a chance to look at that literature and think about it.

One of the writers had a slightly different view, noting that "we wanted to show that kids . . . had things back in ancient history" that connected them to mathematics, but their arguments were not convincing:

> The more interesting thing is what is in the personal culture of each child that is mathematical. Certainly part of that is their history, whether it be racial or ethnic or whatever. We enunciated that ethno-cultural part, but we didn't have anything very strong on the personal-cultural part.

Comparing the NCTM *Standards* to Reform Efforts in Other Countries

One common interpretation of the term *standards* is the notion of accountability expressed by IIAC, which wanted to set standards that would then be used to judge textbooks and tests. This "accountability" approach to educational change has characterized much of the thinking in the US, as well as in England and Australia. The National Curriculum in England is reported to have stalled over accountability issues (Atkin, 1994), including the high cost of producing better tests that are then rejected by politicians because they don't look like traditional tests. There are also problems in Australia (Ellerton & Clements, 1994), where the debates over assessment have divided the mathematics education community. In the US, where the original focus on standards as an accountability tool has been transformed in part to an emphasis on standards as aspiration, will the NCTM *Standards* be more likely to endure?

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